BUILDING STONE in NOVA SCOTIA

by
G.B. Dickie

INFORMATION CIRCULAR
12

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Cover Photo: Old Brookfield Quarry, Terence Bay, Halifax County.

Inset: Master Mason and Apprentice Carver, Dominion Building Restoration, Halifax, 1988.

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Nova Scotia Department
of Mines and Energy
Halifax, Nova Scotia
1988

BUILDING STONE

Introduction

Building stone is a term used to describe types of stone which are used for the construction of buildings and other structures. The stone can be used in a structural capacity where it bears a load or for decorative purposes where it is used as cladding, floor pavers and other decorative panels. Virtually any stone type can be used for building stone. Some of the more common are sandstone, granite, syenite, porphyry, gneiss, felsite and marble.

Sandstone is comprised mainly of quartz grains of sand size set in a fine grained matrix of silt, clay, silica or carbonate cement. Other minor constituents include feldspar, mica and iron minerals. Sandstone occurs in a wide range of colours, grain sizes and textures.

The word **granite** is erroneously used to describe many crystalline igneous rocks used in the building stone industry. Although rocks of a granitic composition make up a large proportion of building stone production, other rock types are used. Quartz, mica and orthoclase feldspar are the constituent minerals of granite, and the mica may be replaced by augite or hornblende. According to the mineral associated with the quartz and orthoclase the different varieties of granite are known as:

Variety of Granite	**Constituent Minerals**
Biotite-granite	Quartz, orthoclase, biotite-mica
Muscovite-granite	Quartz, orthoclase, muscovite-mica
Augite-granite	Quartz, orthoclase, augite
Hornblende-granite	Quartz, orthoclase, hornblende

The crystalline structure of granite varies from crystals of more than 3 cm in length down to grains of microscopic size.

Syenite contains the same minerals as granite, such as orthoclase, hornblende and augite, with the exception that quartz is not present. It also

occurs in a number of varieties depending upon the type of constituent minerals present.

Variety of Syenite	Constituent Minerals
Mica-syenite	Orthoclase, mica (biotite or muscovite)
Hornblende-syenite	Orthoclase, hornblende
Augite-syenite	Orthoclase, augite
Nepheline-syenite	Orthoclase, nepheline

These rocks are somewhat darker than granite and are found in various shades and colours, which, when polished, make beautiful ornamental stones.

Porphyry is a term applied to granites and syenites in which one of the minerals, quartz or feldspar, is very coarse and much larger than the other constituents. Thus there is quartz-porphyry, granite-porphyry, and syenite-porphyry.

Gneiss, which has a laminated structure, is the metamorphic representative of the granites. It is composed of the same constituent minerals which are arranged in layers rather than uniformly distributed as in granite and syenite.

Felsite is a volcanic rock, frequently very fine grained or glassy having a similar composition to granites. It is often an attractive colour with a high degree of hardness so can be highly polished. When these properties are enhanced by a porphyritic or brecciated structure, very attractive stones result.

Marble is the term applied to materials of such varied character and origin that it is almost necessary to define the word in each instance. The term is used here to indicate all calcareous stones of sufficient beauty to be employed for purposes of decoration. Ordinary limestones pass into marbles by the assumption of a crystalline structure, or by the possession of agreeable and variegated colours together with a fine grained texture. In Nova Scotia, both types are represented. There are crystalline limestones of Precambrian age, and variegated fine grained metamorphosed beds of Carboniferous age limestone.

Stone has been used for building construction in Nova Scotia since the first settlements were established in the late 17th and 18th centuries. At that time the stone was obtained either from ship ballast or local fieldstone. Production of domestic dimension stone began in the early 1800s in the Wallace area, Cumberland County and in the

late 1. Province House, Halifax; Wallace andstone.

Plate 2. Halifax Post Office; Wallace sandstone.

Pictou area, Pictou County. Good quality sandstone was produced from both areas and used in the construction of local buildings as well as public buildings in Halifax. Province House (Plate 1) and the Halifax Post Office (Plate 2) were constructed of Wallace stone in 1811 and 1935 respectively. During the mid to late 1800s as many as 75 quarries produced sandstone in Nova Scotia (Fig. 1). Many

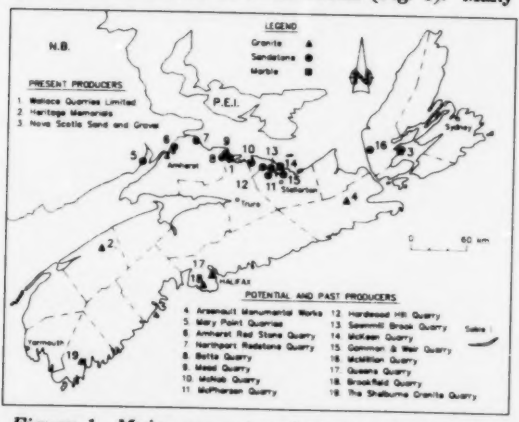

Figure 1. Major present and past producing Nova Scotia building stone quarries.

of these quarries produced only enough stone for the basement course of local buildings. However, the Wallace quarries produced stone for domestic consumption and a flourishing export trade to Central Canada and the eastern seaboard of the United States. A small quantity of Wallace stone found its way as far west as California. Wallace stone has been used in conjunction with Sackville, New Brunswick red sandstone in the recent past in the construction of the Ralph Pickard Bell Library (Plate 3) and other buildings at Mount Allison University in Sackville, New Brunswick. The restoration of the Nova Scotia Legislature in 1987 used Wallace sandstone to replace defective stone. Additional restoration projects in Nova Scotia and other areas will consume significant amounts of Nova Scotia sandstone. A mason apprentice program initiated for the Province House restoration project has provided a workforce capable of carying out stone restoration internationally (Plate 4).

Nova Scotia granite has been quarried and used for foundation courses, monuments, and

Plate 3. Ralph Pickard Bell Library, Sackville, N.B.; Sackville and Wallace sandstone.

Plate 4. Mason and apprentice working Wallace sandstone.

dimension stone. As early as the middle 1700s, the old Queens Quarry on the Northwest Arm, Halifax and quarries at Terence Bay, Halifax County provided much of the granite used in the Halifax area. The front elevation of Saint Mary's Basilica (Plate 5) and the Merrill Lynch Building (Plate 6) were constructed of local granite. Granite quarries operated in Shelburne, Shelburne County, Nictaux, Annapolis County, and West Erinville, Guysborough County produced dimension and monument stone.

In the period 1873 to 1973 a total of 1 000 000 t of stone production was recorded with the Nova Scotia Department of Mines (Fig. 2). Of the total production 90.1 per cent was sandstone, 4.9 per cent granite, 3.1 per cent grindstone and 1.9 per cent quartzite. By far the largest single stone producer was the Wallace quarry (Fig. 3). It has produced a total of 841 000 t of stone in the last 100 years. Approximately 50 per cent of that was dimension stone for building construction.

Plate 5. St. Mary's Basilica, Halifax; Purcell's Cove granite and ironstone.

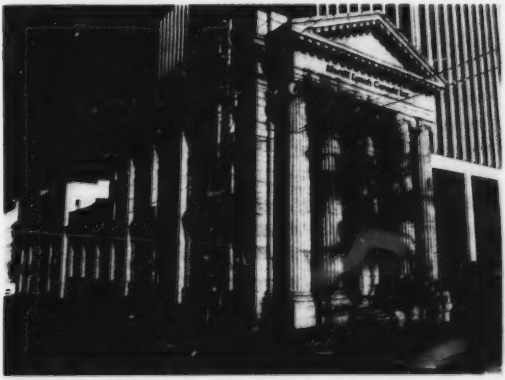

Plate 6. Merrill Lynch Building, Halifax; Terence Bay granite.

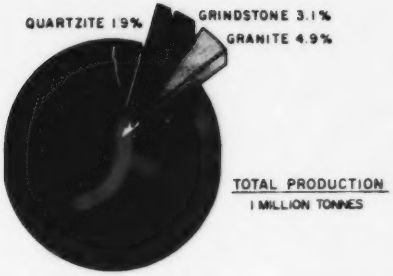

Figure 2. Nova Scotia building stone production, 1873 to 1973.

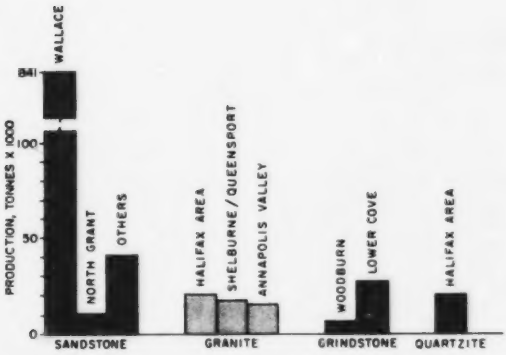

Figure 3. Nova Scotia building stone production by district, 1873 to 1973.

PHYSICAL PROPERTIES

Sandstone and granite are employed for many purposes. They must be tested in a variety of ways to determine their suitability for the particular purpose for which they are to be used.

Granite and sandstone are commonly tested for specific weight, absorption, compressive strength, transverse strength and resistance to abrasion. These characteristics determine the durability of a stone or its capacity to resist weathering agents such as acid rain and pollution, freeze thaw cycles, human and vehicular traffic, chemicals and vandalism.

SANDSTONE

Geology

Over 75 quarries periodically produced sandstone in northern Nova Scotia over the last 150 years. They may be divided into two broad categories and ages (Fig. 4). The red sandstone from Amherst, Cumberland County, Northport, Cumberland County and River John, Pictou County are from the Late Carboniferous lower to middle redbeds of the Pictou Group. The olive, buff and grey sandstones of Wallace, Cumberland County, Eight Mile Brook, Pictou County, Sawmill Brook, Pictou County and the McKeen Quarry, Pictou County are from the Late Carboniferous Boss Point Formation of the Riversdale Group. The Boss Point Formation is predominantly sand deposited in moderate to low sinuosity meandering, sand-dominated streams. The Pictou grey beds exhibit fining upward sequences of conglomerate to sandstone attributed to deposition in low sinuosity streams. The conglomerates constitute channel lags and the sandstones (arkoses), channel fill due to the migration of dunes, which resulted in trough cross-stratification.

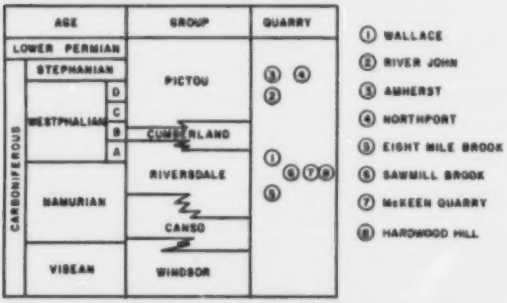

Figure 4. Approximate position of Nova Scotia sandstone quarries in the Carboniferous stratigraphic succession.

Deposits

Wallace Quarry, Cumberland County

The Wallace Quarry has produced three colours of stone in the past. The greatest volume of stone produced was a medium to dark olive-green, fine- to medium-grained massive sandstone of Late Carboniferous age. The average thickness of the quarried unit was 12 m. It overlies a fine-

to medium- grained blue-grey sandstone with an average thickness of about 3 m. A light olive-green sandstone was also produced from small pockets on the northwestern and western sides of the quarry. A diamond-drilling program by the Nova Scotia Department of Mines and Energy in 1986, consisting of 8 holes totalling 318.5 m on the eastern side of the quarry has located additional reserves of sandstone (Fig. 5).

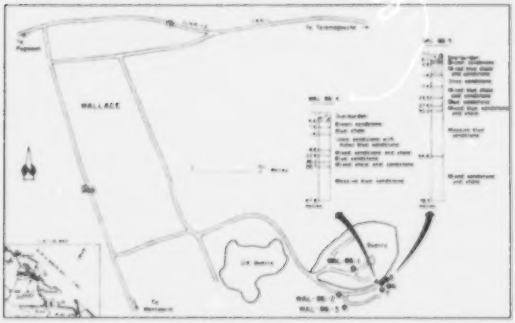

Figure 5. Wallace Quarry diamond drill hole locations and simplified columns.

Between 5.8 m and 8.2 m of massive fine- to medium-grained olive sandstone was intersected in holes Wal-86-4 and -5 beneath 11.6 m of overburden, sandstone and shale. Two units of blue-grey sandstone were intersected below the olive sandstone and a thin shale unit. Approximately 10 000 m^3 of green sandstone and 32 800 m^3 of blue-grey sandstone were outlined by core drilling with the resource open to north and east.

Amherst Quarry, Cumberland County

This is one of the oldest quarries in northern Nova Scotia and the pinkish-red stone raised for building stone from this location is probably as well known as the olive-green Wallace stone. The quarry is about 30 m deep, 90 m in diameter and presently filled with water (Fig. 6).

The Nova Scotia Department of Mines and Energy collared three drillholes on the western side of the quarry in 1986 totalling 113 m. All holes intersected 18.3 m to 21.9 m of red, fine- to medium-grained massive sandstone of the Pictou Group. The stone was overlain by 3.7 m to 4.3 m of overburden and underlain by 11.6 m of red siltstone

and mudstone. This drilling has outlined 27 340 m³ of sandstone and the resource is open in all directions.

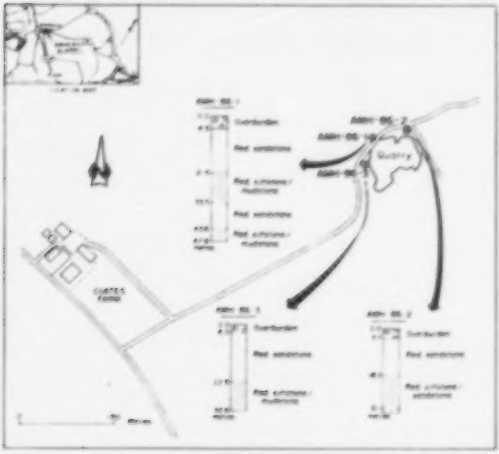

Figure 6. Amherst Quarry diamond drill hole locations and simplified columns.

Eight Mile Brook, Pictou County

A small quarry was operated by a gravestone manufacturer on Eight Mile Brook at the beginning of this century. Mr. McPherson exploited a fine grained, massive, light grey sandstone of the Riversdale Group exposed in the stream bed. A drill program consisting of 7 holes totalling 244 m was carried out in 1986 by the Nova Scotia Department of Mines and Energy. The program was designed to locate the grey sandstone horizon on the northern bank of the Brook on the level of the road to Stillman. Holes EMB-86-3, -4 and -5 intersected the grey sandstone at 5.2 m, 6.4 m and 11 m, respectively (Fig. 7). The grey stone varies in thickness from 6.4 m to 14.3 m and is overlain by 4.6 m to 5.2 m of overburden and minor amounts of brown sandstone. Hole EMB-86-7 intersected 4.6 m of grey sandstone to the northeast along strike. A deposit of 25 800 m³ of high quality grey sandstone is available in this deposit.

Hardwood Hill, Pictou County

A new sandstone quarry has recently opened near Hardwood Hill, Pictou County. Core drilling by the Nova Scotia Department of Mines and Energy in 1986 has outlined the presence of a

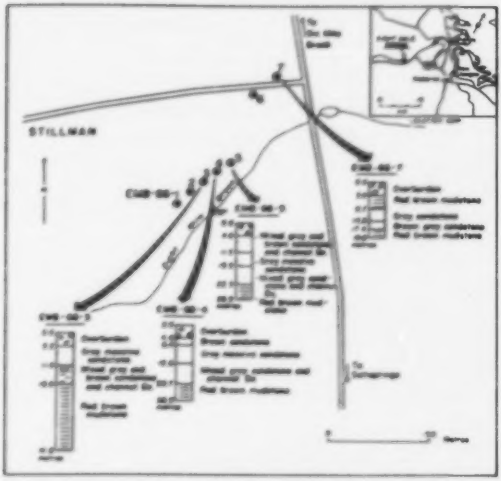

Figure 7. Eight Mile Brook diamond drill hole locations and simplified columns.

large quantity of tan to olive, fine- to medium-grained sandstone at this location (Fig. 8). Bed heights of up to 1 m appear to be present although there are some interbeds of shale throughout the section. At present the sandstone is being quarried for rock fill only and no building stone extraction has taken place.

English Property (McKeen Quarry), Pictou County

This quarry is one of the oldest building stone quarries in Nova Scotia having produced stone for many local buildings and stone for the export market. The sandstone is grey, tan and olive in colour and medium- to coarse-grained. Bed heights vary from 0.3 m to 1.2 m. Up to 5.4 m of overburden is present above 9.1 m of stone with the heavier beds towards the bottom. The beds dip 5° towards the northeast and the generally flat topography suggests large quantities of stone may be present under the northern portion of the English property (Fig. 9). Three drillholes collared by the Nova Scotia Department of Mines and Energy in 1966, in the floor of the old quarry, outlined mixed sandstone and shale to 13.7 m underlain by 6.7 m of shale. The holes intersected coarse grained sandstone from 13.7 m to 47.9 m. Additional drilling is required north of the present face to extend the reserves of the quarry. Little is to be gained by quarrying deeper.

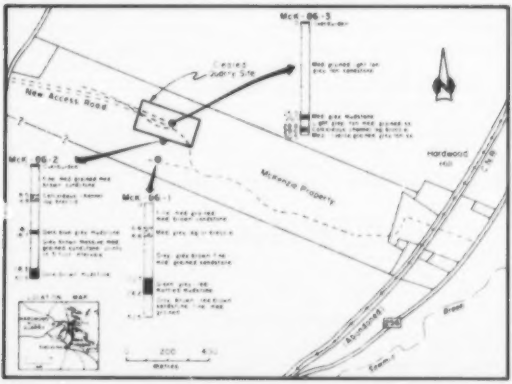

Figure 8. Hardwood Hill diamond drill hole locations and simplified columns.

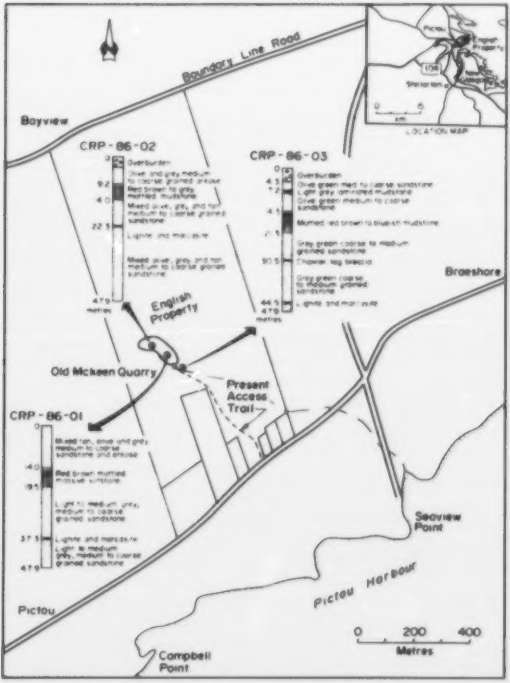

Figure 9. English Property diamond drill hole locations and simplified columns.

GRANITE

Granites are the most universally used monumental and building stones and are widely used as cladding panels, pavings, thresholds, steps and risers, and for monument blanks and press rollers. At present Heritage Memorials Ltd., Windsor, Hants County is the only granite producer which operates a granite quarry. Heritage produces a small amount of blue grey granite from the Nictaux Quarry for use as monument blanks and bases. Nova Scotia is at present importing significant amounts of red, black and various shades of green granites from Africa, India, Quebec and Ontario. Due to high quarrying costs and the small volumes of stone required annually by Nova Scotia monument fabricators, most are finding it less expensive to purchase imported stone. If a superior quality black or red granite can be found in sufficient quantity locally it may be possible to enter the lucrative export market.

Geology

A large portion of Nova Scotia is underlain by granitic rocks. Past granite production has exploited the South Mountain Batholith and its related satellite plutons. The Batholith is a composite intrusion consisting predominantly of grey coarse grained granodiorite to monzogranite. The pluton borders are generally fine grained and have hosted most of the former granite producers.

The eastern shore region of the Province boasts a number of zoned plutons of gabbroic composition. The Arsenault Monumental Works Ltd. black granite quarry at West Erinville, Guysborough County produced thin slabs of a good quality black granite until the middle 1960s.

The Cape Breton Highlands are underlain by a number of granite plutons with colours ranging from grey to red to black. Due to the overburden cover and deep weathering in some areas, prospecting for economic granite deposits is difficult. The Cobequid and Antigonish Highlands areas are also underlain by granite plutons. Although no granite production has occurred in these regions previously, the variety of colours present may warrant some exploration.

Table 1. Physical properties of Nova Scotia building stone (after Parks, 1929).

Quarry	Stone Type	Colour	Specific Weight lbs/ft^3
Wallace	sandstone	blue	145.87
Wallace	sandstone	olive	144.81
Amherst	sandstone	pinkish-red	142.93
Eight Mile Brook	sandstone	grey	142.42
Hardwood Hill	sandstone	tan	—
English Property	sandstone	olive, tan	141.65
Terence Bay	granite	white	164.95
Halifax Quarries	granite	grey	167.76
Nictaux Quarry	granite	blue	167.63
Shelburne	granite	grey	167.02

*After Parks (1914).

Absorption %	(Compressive Strength) lbs/in^2	Transverse Strength lbs/in^2
5.58	15,633	1534
5.90	13,681	1838
6.894	11,122	551
6.66	16,888	n/a
n/a	8,520 (unconfined)	962
6.85	10,348	869
0.209	25,893	2269
0.208	25,959	2439
0.137	34,058	3572
0.172	28,440	n/a

Deposits

Terence Bay, Halifax County

Granite building stone was quarried in the late 19th century from the Terence Bay area and used in the construction of several buildings in Halifax. It was chiefly used for basement courses and just above the damp proof course in sandstone buildings. Two types of granite are available in the Terence Bay area. A white monzogranite containing less than 10 per cent mafic minerals is present on the shoreline directly across the Terence Bay River from the Village of Terence Bay. Farther inland the monzogranite is more grey in colour and has typically more mafic minerals.

The Nova Scotia Department of Mines and Energy collared 12 drillholes for a total of 311 m in three locations in the Terence Bay area in 1987. All holes intersected granite to the total depth tested. The most northerly site was outlined to be the best suited for building stone and a total of 223 000 m^3 of granite was identified to a depth of 13.7 m. There is no overburden cover and vertical jointing is limited to less than one joint per 40 m in both directions. Horizontal joints appear to be limited to a main set at about 4.6 m deep. The resource is considered to be open in all directions.

Nictaux, Annapolis County

Near the village of West Nictaux, which is located a short distance from the Town of Middleton, Annapolis County, a medium- to fine-grained blue grey granite is presently being quarried. Heritage Memorials Ltd. quarries about 560 m^3 of blue granite per year for use as monument bases, blanks and other specialty products. The presence of quartz veins and high angle joints makes it difficult to consistently quarry large blocks.

Halifax Area, Halifax County

Past granite production from the Halifax area occurred along the margin of a granite pluton which covers a very large area west of the City. The rock is a grey medium- to coarse-grained porphyritic granodiorite which contains abundant xenoliths or knots of slate. Large quantities of the stone has been used in building construction, for curbstone and paving blocks. A small pluton of monzogranite occurs in the Lake Fletcher area northwest of Halifax. The border phases of this pluton are a pleasing

white colour and are very fresh looking. Further exploration of this pluton may discover a significant tonnage of good quality stone.

Shelburne, Shelburne County

Past production of granite for monuments and building construction took place near the Shelburne Harbour area. The rock consists of a fine- to medium-grained, grey muscovite-biotite granodiorite to monzogranite. Although there is no production from the area at the present time, the stone has proven very suitable for architectural work in the past.

CRYSTALLINE LIMESTONE, LIMESTONE, MARBLE, AND FELSITE

Significant quantities of marble are imported into North America for use as decorative panels, floor tiles and trim for both interior and exterior applications. The use of marble and other decorative rocks is also increasing in the manufacture of exposed aggregate panels. Stone chips are also being used in the landscaping field as is stone for walls and walks. Minor amounts of marble and alabaster are used by sculptors and other specialties of the arts.

MARBLE

Large deposits of white, grey and banded marble occur on Cape Breton Island at Glencoe, Inverness County, Marble Mountain, Inverness County and George River, Cape Breton County. The marbles tend to be narrow in width and structurally deformed at most locations although sections of white marble, up to several hundred metres in width, have been intersected by core drilling at the Glencoe deposit.

The Marble Mountain deposit is presently being exploited by Nova Scotia Sand and Gravel Ltd. for the production of white marble chips primarily sold in bags at garden centres. This material may also be well suited for the production of chips for exposed aggregate panels.

FELSITE

Cape Breton Island hosts volcanic rocks which are frequently very fine grained, hard and of attractive colour. When these properties are enhanced by a porphyritic or brecciated structure, very beautiful stones result.

Scatarie Island, Cape Breton County hosts felsite breccias of very beautiful colour variations. Two types are present, the first is comprised of large bright red fragments in a deep green matrix. The second type contains deep green fragments in a red matrix. The fracture and joint patterns are very closely spaced rendering the stone unsuitable for the production of large blocks. The breccias would however, make very attractive decorative chips for exposed panels, landscape chips and other products which require small fragments. The vivid colours are unsurpassed in this type of stone.

MINERAL RIGHTS

Building stone is not defined as a mineral under the Mineral Resources Act of Nova Scotia. In order to open and operate a building stone quarry, the surface rights for the property must be held by the owner of the quarry or arrangements must be made with the landowner to develop the quarry. On land which is owned by the Crown, the Nova Scotia Department of Lands and Forests is the agency responsible for their administration.

BUILDING STONE QUARRIES IN OPERATION IN 1988

Wallace Quarries Ltd., Wallace Cumberland County - blue, dark olive, light olive sandstone.

Marble Mountain Quarry, Nova Scotia Sand and Gravel Ltd., Inverness County - white marble chips.

Nictaux Quarry, Heritage Memorials Ltd., Annapolis County - blue grey granite, fine grained.

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Minister

John J. Laffin, P. Eng., FEIC
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Halifax, Nova Scotia
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Canada—Nova Scotia
Mineral Development Agreement

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